Mechanical Design of the SNS MEBT*

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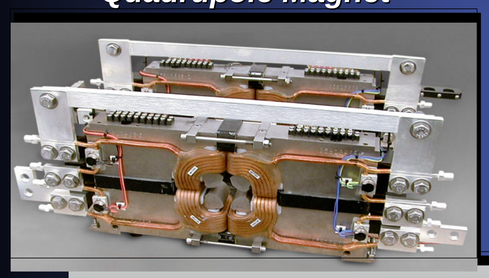
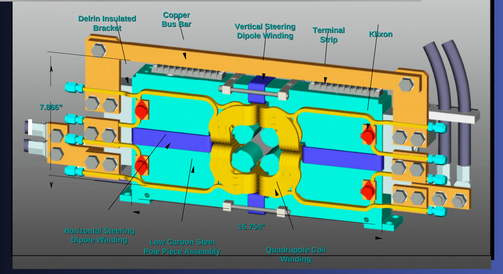
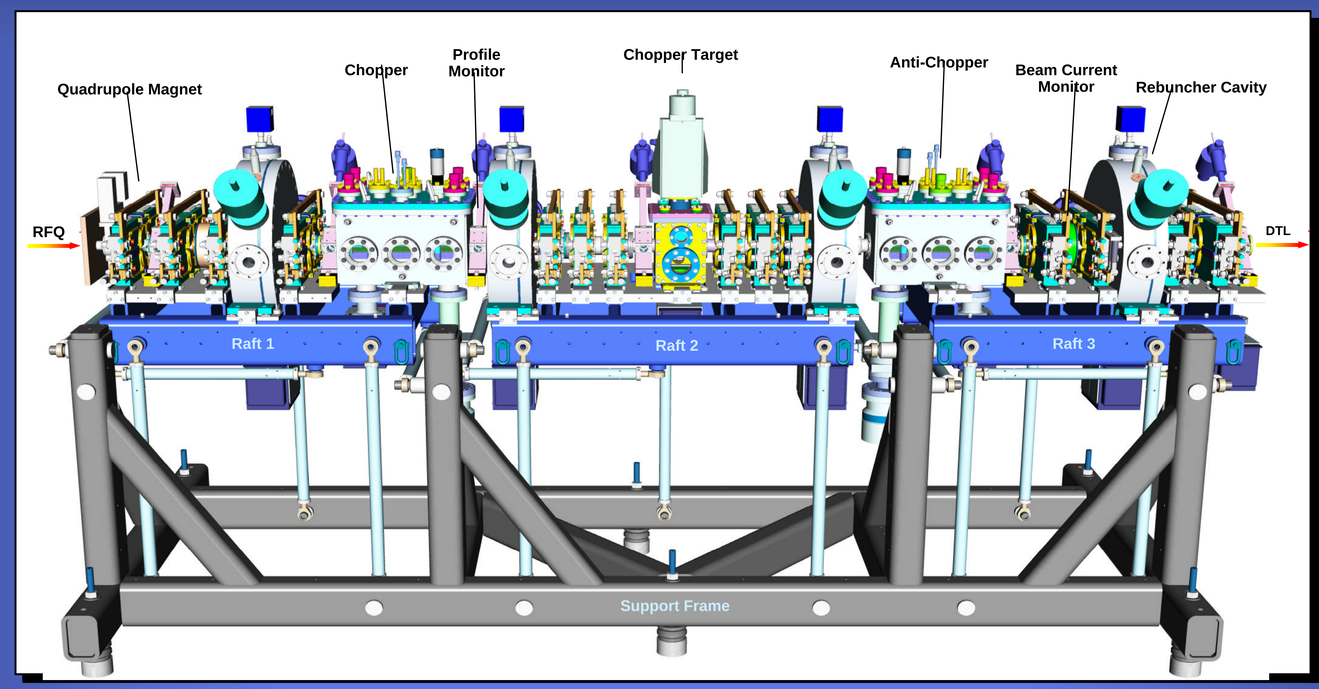
Lawrence Berkeley National Laboratory (LBNL) is presently designing and building the 2.5 MeV front end for the Spallation Neutron Source (SNS). The front end includes a medium-energy beam transport (MEBT) which carries the 2.5 MeV, 38 mA peak current, H^- beam from the radio frequency quadrupole (RFQ) to the drift tube linac (DTL) through a series of 14 electromagnetic quadrupoles, four rebuncher cavities, and a fast traveling wave chopping system. The beamline contains numerous diagnostic devices, including stripline beam position and phase monitors (BPM), toroid beam current monitors (BCM), and beam profile monitors. Components are mounted on three rafts that are separately supported and aligned. The large number of beam transport and diagnostic components contained in the 3.6 meter-long beamline necessitates an unusually compact mechanical design.

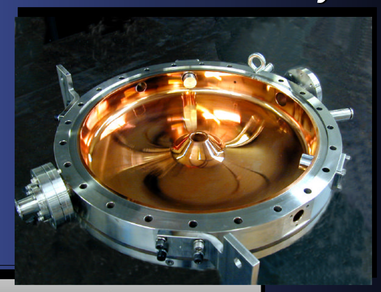
Quadrupole Magnet

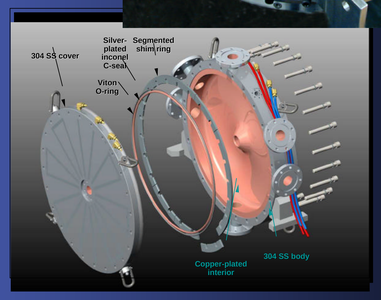




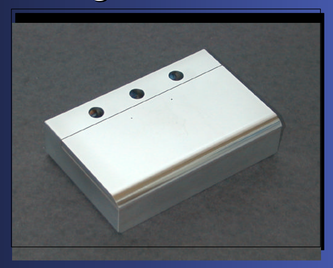


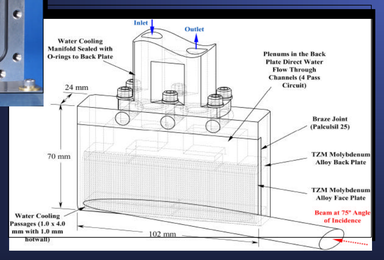
Rebuncher Cavity





Chopper Target

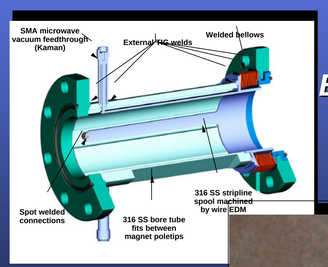




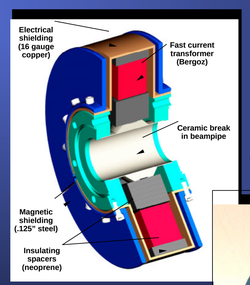
MEBT Design Parameters

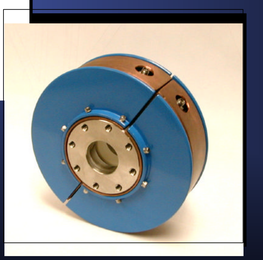
Parameter	Value
Overall Length	3.6 m
Output peak operating current	38 mA
H^- beam energy	2.5 MeV
Duty Factor	6%
Number of quadrupoles	14
Quads 1-4 and 11-14 bore diameter	3.2 cm
Quads 5-10 bore diameter	4.2 cm
Effective magnetic lengths	6.1 / 6.6 cm
Maximum quad gradient	36 T/m
Number of two-plane beam steerers	6
Maximum steering angle	1.5 mrad
Number of rebuncher cavities	4
Rebuncher cavity type (402.5 MHz)	TM010 pillbox
Rebuncher peak voltage integral	75,45,51,106 kV
Number of beam position and phase monitors	6
Number of beam current monitors	2
Number of beam profile monitors	5
Quad RMS positional accuracy on raft	0.025 mm
Raft RMS positional tolerance on support frame	0.04 mm
Simulated emittance growth w/ uncorrectable errors	10%

Beam Position and Phase Monitor

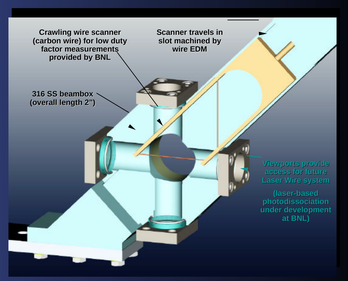


Beam Current Monitor





Beam Profile Monitor



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